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at a bull when you've got him down. It's unnecessary. And it shows a mean spirit.

*Daphne's Mother* (to her daughter): What did I tell you, Daffy!

HAROLD GODDARD.

SWARTHMORE COLLEGE.

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## REVIEWS AND ABSTRACTS OF LITERATURE

*Movement and Mental Imagery.* MARGARET FLOY WASHBURN.  
Vassar Semi-centennial Series. Boston: Houghton Mifflin. 1916.  
Pp. xv + 243.

The author takes the motor factors which have frequently been used in theories of attention, perception and emotion, and carries them farther to explain association, memory, imagery and thought.

The book begins with a brief account of nervous conduction and of the learning process, leading up to the concept of a "movement system" in which the kinesthetic sensations from one movement afford the stimulus for the next movement. There are "static movement systems" like those involved in maintained bodily postures, and "phasic movement systems" which involve translation—the movements in the former case being simultaneous and in the latter successive.

The theory is advanced that all consciousness is related to movement. An attempt is made to reconcile the opposed facts that consciousness accompanies obstructed motor discharge (habit formation) and that it accompanies free discharge (action theory), by assuming that there is an optimal ratio of excitation to inhibition in motor discharge above or below which consciousness is lessened.

The image depends upon the initiation of a motor response. When a motor center is excited under certain conditions there is disturbance in sensory pathways connected to it with low synaptic resistance and this is accompanied by consciousness. When the sensory pathway in question is excited from within we have the image. The excitation apparently depends on a "successive movement system" (*supra*), *i. e.*, kinesthetic stimuli. This explains the short duration of imagery *vs.* sensation because the kinesthetic stimuli are brief. The image thus comprises a kinesthetic component and one of the modality to which the image is referred, *e. g.*, visual. Some readers will doubtless query what is the actual physiological accompaniment of this visual aspect, and it is not quite clear from the discussion what happens in the visual center or in its pathway to the kinesthetically excited motor center. Is there a backward

effect of the excitation from motor center to sensory or some "drainage" mechanism? There is a hint of this latter in a footnote. Connections between sensory centers are ruled out by the theory.

In current motor theories of attention it is immaterial whether there is a mere motor impulse toward the object attended or an actual movement. In the theory advanced in the present book there must be a slight actual performance of movement ("tentative movements"). All thought and imagery rests on these tentative movements, and "when the system runs smoothly we have unconscious thought and when delays occur we have sensations and images."

The chapter on "Recurrence of Movements" gives quite an exhaustive survey of the experimental literature on the memory image and the memory after-image and of the conflicting views as to the existence and nature of the latter. It is assumed that there is a tendency for movements, full or tentative, to repeat themselves spontaneously just after they are performed. This explains why things not attended to in the original stimulus may recur in the memory after-image although they never appear in the memory image. Being unattended they enter into no new movement systems, *i. e.*, produce no kinesthetic sensation, and hence can not be recalled after an interval. But the motor centers may become spontaneously active shortly after the stimulus and arouse the details in the memory after-image.

The association of ideas, it is claimed, is really an association between the kinesthetic sensory path produced by a reaction to one stimulus and the motor path connected with the second stimulus. A detailed study follows of the laws governing the strength of associative dispositions: measurement of strength of association,—time for recall, resistance to formation of new associations, and number of repetitions necessary; the effect of repetition—involving as it does a wider variety of tentative movements; the effect of time—rate of forgetting, recency, frequency, *etc.*; the interference of associative dispositions—various forms of inhibition. This chapter gives a good survey of experimental methods and results in memory, recognition and forgetting. Other factors such as the effect of rhythm, place in a series and constellation are discussed similarly in the following chapter.

The author then applies her theory to the higher processes. The problem idea that directs the thought process is characterized mainly by its persistence of influence, and this is due to persistent tentative movements. The persistence comes from association of the motor excitation on which an idea is based with an internal static move-

ment system—the activity attitude,—and the activity attitude in turn is set up only when the idea appeals directly or indirectly to some instinct. Judgment involves delay while the movement systems concerned with the subject recur for an instant. Reasoning has a longer delay and involves movement systems connected with two other such systems (the premises). Even the undistributed middle and illicit processes are explained by improper development of movement systems.

The conflicting views on imageless thought are summarized. Considerable significance is attached to the fact that some of these imageless processes can be named and others not, and it is assumed that all namable ones are based on kinesthetic excitations. A number of common instances are analyzed, *e. g.*, “difference” is a “shift of motor excitation;” “but” occurs when dispositions of equal strength tend to excite incompatible movements. The non-namable variety of imageless thoughts occurs either when something is blocking the associative process or when thinking is especially rapid, *i. e.*, when there is a condensation of imagery.

The final chapter deals with cases of dissociation. Automatic writing is possible on the author’s theory when incompatible movements are not involved. Sleep is an attitude of relaxation, and deep sleep without motor contractions is unconscious, for consciousness depends on movement (*supra*). The Freudian “censor” is the most firmly established movement system. Hypnotism is similar to sleep, the suggestion coming however from a concentrated rather than diffused source.

The book consistently follows the motor theory of consciousness through the higher mental processes. Quite a number of assumptions are necessary in the development of the theory and probably will not meet with universal acceptance. The author hints at the outset that her intention is a pragmatic one, and the assumptions appear to work well. Aside from the developments of the motor theory the book gives a good summary of the extensive literature on memory, imagery and the thought process. The attempt to adequately summarize these fields in which such a mass of material has been published, (and so much of it worthless) is heroic, and it is well done. To the majority of readers this aspect of the book will be more valuable than the theoretical. Any student approaching topics in imagery and the thought process would do well to consult it for a preliminary survey of the field. He would be appreciably assisted also by the appended bibliography of 162 titles.

HAROLD E. BURTT.

HARVARD UNIVERSITY.